



**RAJKOT MUNICIPAL CORPORATION
RAJKOT**

: Name of Work :

Providing, Lowering, Laying, Jointing, Testing and Commissioning of D.I. K-9 Pipe for Transmission Main from AJI to TirupatiNagar & Swati Park Head-works for water supply system of Kothariya area of Rajkot.

e-TENDER No. RMC/WW/CZ/KTL-2

:: Milestone dates of e-Tendering ::

1. Downloading of e-TENDER documents	Dt. 07/02/2019 to Dt. 28/02/2019 up to 17:00 Hrs.
2. Pre-bid Meeting	Dt. 11/02/2019 at 12:00 Hrs. at Central Zone Office-RMC.
3. Online submission of e-TENDER	Dt. 28/02/2019 up to 18:00 Hrs.
4. Physical Submission of EMD, Tender fee, Documents required for pre-qualification and other necessary documents.	Dt. 01/03/2019 to Dt.02./03/2019 up to 18:00 Hrs.
5. Verification of submitted documents (EMD, Tender fee, Documents required for pre-qualification and other necessary documents.)	Dt. 05/03/2019 Onwards.
6. Opening of online Primary Bid (Technical bid)	Dt. 05/03/2019 at 10:30 Hrs. Onwards
7. Agency to remain present along with original documents for verification	Dt. 07/03/2019 between 16:00 to 18:00 Hrs.
8. Opening of online Commercial Bid (Price Bid) for Technically qualified bidders only	Dt. 08/03/2019 at 11:00 Hrs. Onwards
9. Bid Validity	One Eighty (180) calendar days

FEBRUARY-2019

VOLUME – II (TECHNICAL - BID)

DETAILED TECHNICAL SPECIFICATIONS

Authority :
Executive Engineer
Water Works Department, Central Zone,
Second floor, Room no.-06,
Rajkot Municipal Corporation
Dr. Ambedkar Bhavan Dhebar Road,
RAJKOT - 360 001.

Providing, Lowering, Laying, Jointing, Testing and Commissioning of D.I. K-9 Pipe for Transmission Main from AJI to TirupatiNagar & Swati Park Head-works for water supply system of Kothariya area of Rajkot.

VOLUME – II
Detailed Technical Specifications

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GENERAL TECHNICAL SPECIFICATIONS

1. Scope of Contract:

The work entitled “Providing, Lowering, Laying, Jointing, Testing and Commissioning of D.I. K-9 Pipe for Transmission Main from AJI to TirupatiNagar & Swati Park Head-works for water supply system of Kothariya area of Rajkot.”.

The scope of works comprises the following:

- Detailed design of the water supply transmission line
- Carrying out necessary topographical survey and geotechnical investigations
- Excavation of pipe trenches in soil, soft rock, hard rock, WBM and concrete roads, including dewatering.
- Supplying and Laying of DI pipes with all specials along the route as per the network map
- Jointing of pipes with existing pipes (wherever required) with all required accessories
- Obtaining statutory approval from railway and other government bodies if required.
- Contractor shall plan and accordingly phase the supply of items according to his requirement to best utilize the available storage space at site.
- Providing and fixing sluice valves, Scour valves and Air Valves on the existing as well as new pipeline, as specified in relevant datasheets, detailed technical specifications, particular technical specifications and BOQ.
- Providing pipe bedding as per the requirements.
- Backfilling of pipe trench with selected soil immediately after erection of pipe excluding pipe joints.
- Encasing of underground pipelines as per specifications.
- Hydro testing of pipeline in segments.
- Backfilling of pipe trench at pipe joints.
- Detailed Designing and Construction of RCC Sluice/ Butterfly Valve Chambers/RCC Thrust blocks/ Saddles/ Anchor blocks. The typical drawings for various structures are enclosed in Bid drawings for reference.
- Reinstatement of WBM, Tar and Concrete Roads after laying and testing of pipeline.
- Demolishing old structures in the route of pipeline, if required.
- Flushing of entire pipeline with clean water at least for 24 hours.
- Testing and commissioning.
- Preparation of as-built drawings.

The site of tendered pipeline work is DI pipelines with their fittings is for water supply system for Transmission Main for Kotharia Area only as shown in the pipeline network drawing at Rajkot,

(Location map is shown in the tender drawings). A tapping will be taken from Aji Filter Plant for TirupariNagar & Swati Park Head-works for Kotharia Area water supply system.

Map



1.1. Delivery Schedule:

The contract time shall be **as prescribed in tender document, from the notice to proceed.** The contractor shall submit his delivery schedule and the programme of works together with his tender in conformity with delivery schedule given in the documents.

1.2. Packing and Handling:

- a. Necessary care shall be taken and required packing shall be provided to avoid damage to pipe barrels and the edges of the pipe ends in transit.
- b. Where the goods are required to be dispatched at Railway risk, special packing as per IRCA rules are absolutely necessary, which would be payable by the contractor himself.
- c. The contractor shall use proper handling equipment or follow suitable standard handling method for DI pipes & DI Specials as approved by the Engineer-in-charge to unload the materials at the delivery site to prevent damage to the goods.
- d. The contractor shall take all care for Transportation & supply of HC connections items to be supplied with its standard handling process, stored at site under his store / the delivery site to prevent damage to the goods.

2.0 General Specifications:

All the items occurring in the work and as found necessary during actual execution shall be carried out in the best workman like manner as per specifications and as per instructions of the Engineer-in-charge. All material should be from approved vendor for that material

Extra claim in respect of extra work shall be allowed only if such work is ordered to be carried out in writing by the Engineer-in-charge and the same is made in a fortnight after its occurrence.

The contractor shall engage a qualified Engineer for the execution of work who will remain present for all the time on site and will receive instructions and orders from the Engineer-in-charge or his authorized representative. The instructions and orders given to the contractor's representative on site shall be considered as if given to the contractor himself.

A work order book as prescribed shall be maintained on the site of the work by the contractor and contractor shall sign the orders given by the inspecting officers and shall carry out them promptly.

Quantities specified in the tender may vary at the time of actual execution and the contractor shall have no claim for compensation on account of such variation.

Diversion of road, if necessary, shall be provided and maintained during the currency of the contract by the contractor at his cost.

Figured dimensions of drawings shall supersede measurements by scale. Special dimensions or directions in the specifications shall supersede all other dimensions.

All levels are given in drawings and the contractor shall be responsible to take regular levels on the approved alignment before actually starting the work. The levels shall be connected to the G.T.S. levels and shall be got approved from the Engineer-in-charge.

If the arrangement for temporary drainage is required to be made during any work of this contract, this shall be made by the contractor without claiming any extra cost.

3. Classification of Strata:

All materials encountered in excavation will be classified in the following groups irrespective of made of excavating the materials and the decision of the Engineer-in-charge in this regard shall be final and binding to the contractor.

3.1. Soils & Hard Murrum:

Soils of all sorts, silt, sand, gravel, soft murrum, stiff clay, kunkar and other soft excavation not covered in the items mentioned hereunder. Hard materials comprising of all kinds of disintegrated rock or shale or Indurate conglomerate interspersed with boulders of size between 0.02M³ and 0.75M³, weathered and decomposed rock, which could be removed with, pick, bar, shovel wedges and hammers, though not without some difficulties.

3.2. Soft-Rock & Hard-rock:

This shall include all materials which is rock but which does not need blasting and can be removed with a pick, bar, wedges, pavement breakers, pneumatic etc. This shall include rock occurring in mass or boulders bigger than 0.75 M³ each which need blasting. This will also include rock to be removed by chiseling or any other method where blasting is not permissible.

The contractor will have to arrange for land, power and water for manufacture of pipes. However, if requested by the contractor, the Engineer-in-charge after due verification of facts will recommend to appropriate authority for obtaining land and power for manufacture of pipes under this contract.

TECHNICAL SPECIFICATIONS

ITEM NO.1: EXCAVATION WORK

Excavation in Trench for pipe in all types of strata (incl. all safety provision) including lifting and laying in 90 mtr. Lead area as instructed etc comp.

**0.0 to 1.50M depth. AND
1.51 to 3.00M depth**

Excavation for pipe line trenches with shoring, strutting, bailing or pumping out watered from trenches whenever necessary of required length, width and depth including extra excavations for sockets and all safety measures and provisions such as site rails fencing, lighting, watching including refilling the trenches in layers including ramming and removing the excavated staff with 90m lead and clearing the site etc. as stipulated in the tender specification complete before starting work and after completion of work for all lifts and soil strata as specified.

- a) In all sorts of soil soft murmur, hard murrum, boulders, macadam and asphalt roads including breaking of lime and cement masonry and lime concrete.
- b) In soft rock, cement concrete, hard rock, and cutting of cement concrete and R.C.C. of any proportion, etc. with controlled blasting and or chiseling whichever is necessary and feasible as required by site conditions.
- c) In hard rock,

1.1 Clearing of sites :

- 1.1.1 The site at which the pipe line is to laid and the area required for setting out and other operations shall be cleared of all obstructions, loose stones, and rubbish of all kinds; stumps of trees, brushwood as well as all trees shall be removed as directed. The roots shall be entirely grubbed up.
- 1.1.2 The products of the clearings to be stacked in such a place and in such a manner, As directed by the Engineer-in-charge.
- 1.1.3 In site clearing, all trees not specially marked for preservation, bamboos jungle wood and brush wood shall be cut down and their roots grubbed up. All wood and materials from the clearing shall be the property of corporation and shall be arranged as directed by the Engineer-in-charge or his authorized agent. The materials found to be useful by the Engineer-in-charge shall be conveyed and properly stacked as directed within the specified limit. Unless materials will be burnt or otherwise disposed off as directed.
- 1.1.4 All holes or hollows, whether originally existing or produced by digging up roots, shall be carefully filled up with earth, well rammed and leveled off, as may be directed shall not be paid for. The contractor shall get approval of design of

shoring. The shoring shall be of sufficient strength to resist side pressure and ensure safety from slips and blows and to prevent damage to work and property and injury to persons. It shall be removed as directed after all the items of work for which it is required are completed.

1.1.5 Protection :

1.1.5.1 The foundation pits and trenches, etc shall be strongly fenced and red light Signals shall be kept at night in charge of watch-man to prevent accidents. Sufficient care and protective measure shall be taken to see that the excavation shall not affect or damage the adjoining structures. The contractor shall be entirely responsible for any injury to life and damage to the properties etc. Necessary protection work such as guide ropes, crossing places, barricades, the contractor at his own cost shall provide caution boards etc.

1.6 Classification of Strata :

1.6.1 The decision regarding classification of strata shall rest with the Engineer-in- Charge and his decision shall be final and binding to the contractor.

1.6.2 All the materials encountered in the excavation shall be classified as described in 2.0 of general specifications.

1.7 Dewatering :

1.7.1 Unless specially provided for as a separate item in the contract, the rate of excavation would include bailing or pumping out all water met with in excavation or which may accumulate in the excavation during the progress of the work either, by percolation, seepage, springs, rain or any other cause and diverting surface flow if any, by earthen bunds or by other means. The bunds shall be removed as soon as the work is completed.

1.7.2 Unless specially provided as a separate item of contract, pumping of water from foundation pit, trenches etc shall be carried out by the contractor at his won cost and he shall arrange for required numbers of dewatering pumping sets for the above work. He shall take precaution to prevent any damage to the foundation trenches, concrete or masonry or any adjacent structure. The excavation shall be kept free from water by the contractor (1) during inspection and measurement (2) When concrete and/or masonry work are in progress and till the construction work reaches above the natural water level and (3) till the Engineer – in – charge considers that the mortar is sufficiently set. The rate shall be paid for cum. of excavation.

1.8 Excavation in Rock :

1.8.1 Blasting with Gun Power:

Blasting operations shall be carried out with the prior permission and in the presence of the Engineer – in – charge or his authorized representative and during fixed time hours of the day. All safety precautions such as providing safety nylon netting etc. shall be carried out as per instructions of the Engineer – in – charge.

Red danger flags shall be prominently displayed and all the people, except those who have actually to light the fuse must be away to a safe distance, not less than 200 meters.

All fuses shall be cut to the length required before being inserted into the holes.

The number of charges to be fired and the actual number of shots heard shall be compared and the person responsible must satisfy himself by examination that all the charges have exploded before work people are permitted to approach the scene. The withdrawal of a charge which has not exploded shall under no circumstances be permitted, but the tamping and charge shall be flooded with water and the hole marked in a distinguishing manner. The next hole to be fired shall be at a distance of about 500mm from the old hole and fired in the usual way.

The contractor or any of his competent authorized person shall be in charge of the blasting operations and shall be held responsible for strictly observing the safety rules, particularly applicable to blasting operations, in addition to other safety rules.

In blasting rocks with dynamite, the following general principles shall be observed.

In general, the following diameter of drills shall be used for different depth of boreholes:

From 1 – 2 metres	25 mm diameter
From 2 – 3 metres	37 – 50 mm diameter
From 3 – 4.75 metres	50 – 60 mm diameter

The borehole should generally be not more than 1.3m deep and the distance apart should be from one and half to twice the depth.

Cracks and fissures in the rock to be blasted shall be carefully studied to ascertain the best portion for the boreholes. Charge shall always be placed in a round piece of rock, if possible not nearer than 30mm from the crack.

Rules for blasting with dynamite and other high explosives

The person - in- charge must show that he is thoroughly acquainted with all blasting operations and that he understands the rules herewith laid down. He will be held responsible for any accident that may occur.

Boreholes must be of such sizes that the cartridge can easily pass down them. The position of all holes to be drilled must be marked out with white paint and the person – in – charge must take particular note of these positions.

The drilling operation being finished, the person – in – charge must make a second inspection and satisfy himself that the boreholes marked out by him have been drilled. The person – in – charge must prepare all charges necessary for boreholes.

Only ten holes may be loaded and fixed at one time and the charges should be fixed simultaneously as far as practicable. Boreholes must be thoroughly cleared before a cartridge is inserted.

The loading is to be done by the person – in – charge himself and the position of the charge holes carefully noted by him. Wooden tamping rods only to be used in charging holes (not pointed but cylindrical throughout, one cartridge at a time must be inserted and gently pressed with the tamping rod.

Immediately before firing blast, due warning must be given and the person – in – charge must see that all the labourers have retired to safety.

The safety fuse of the charged holes are to be lighted in the presence of the person – in – charge, who must see that the fuses of the holes charged have properly ignited. After the blast, the person – in – charge must carefully inspect the work and satisfy himself that all the charges have exploded.

1.8.2 Misfires:

Misfires are a source of great danger, if it is suspected that part of the blast failed to fire or is delayed, allow sufficient time to elapse before entering the danger zone. When fuse and blasting caps are used, a safe time, at least of an hour should be allowed.

None of the drillers are to work near this hole until the two following separations have been done by the person – in – charge.

(a) The person – in – charge should very carefully extract the tamping with a wooden scrapper and withdraw the fuse with the primer and detonator attached, after which a fresh primer and detonator with fuse should be placed in this hole and fired or.

The hole may be cleared of 300mm of tamping and the direction then ascertained by placing a stick in the hole. Another hole may then be drilled 150mm away and parallel to it, the hole to be then charged and fired. The person – in – charge shall also at once report to the Engineer – in charge all cases of misfire, that cause of the same and what steps have been taken in connection herewith.

1.8.2.1 Precautions against misfire:

The safety fuse should be cut in an oblique direction with a knife.

All saw dust must be cleared from the inside of the detonator this can be done by blowing down the detonator and tapping the open end. No instrument shall be inserted into the detonator for this purpose.

After inserting the fuse in the detonator, it shall be fixed by means of nippers.

If there is water present, or if the boreholes be damp, the junction of the fuse and detonator must be made water tight by means of grease, white or lead.

The detonator should be inserted into the cartridge, so that about one third of the copper tube is left exposed outside the explosives. The safety fuse outside the detonator, should be necessarily tied in position in the cartridge. Water proof fuse only to be used in the damp boreholes, or when water is present in the bore-holes.

If a misfire has been found to be due to defective fuse detonator or dynamite, the whole quantity or box from which the defective article was used shall be rejected.

Storage of materials for blasting shall be as per regulations/stipulations of the concerned authorities.

It shall be the contractor's responsibilities to arrange proper storage of explosives and obtain required permission from concerned authorities. No separate payment will be made for the above.

The refilling will generally refer to refilling of trenches up to ground level with excavated stuff.

Filling materials shall be from excavated stuff.

Excavated stuff to be used shall be cleared of all rubbish, large size stones, brick bats etc. Big clods shall be broken down to a size of 50 mm or less.

1.9 Refilling :

After the pipes have been laid and jointed and the chambers are constructed and as soon as the joints have been inspected and passed by the Engineer-in-charge, the pipe line has been tested for water tightness, and after all concrete work thoroughly set the trenches shall be fulfilled with the materials taken there from. In refilling the trenches, the utmost care shall be exercised so as not to disturb, break or damage the jointed pipes. over and around every pipe, the finest selected material shall be put. No lumps of rock earth or other material around the pipe or be thrown into the trenches until the same has been broken to specified size and pipes covered by the fine material above referred to. The selected fine material shall be carefully placed next to the permanent work and well packed and well rammed in layers of 150mm for a depth of at least 300mm over the top of the pipe. The remaining of

the excavation shall be filled in with the best and most suitable portions of the excavated material in layers of not more than 600 mm deep, each layer shall be thoroughly rammed before the next layer is placed. One man shall be employed for hand ramming for every 30m of refilling up to the level of 300mm over the top of the pipe. Surplus soil shall be piled on top of the filling to the extent possible for expected subsidence. All road materials to form a compact neat surface. The surface of the filled in trench shall be hand rolled by a hand roller weighing not less than ½ tones as directed by the Engineer-in-charge.

The contractor shall maintain all refilling and surfaces until reinstated. The contractor shall be responsible for claims arising from accidents due to subsidence or inadequate maintenance or improperly refilling work.

The contractor shall be responsible for any settlement during the defects liability period including monsoon and the same shall be refilled with stuff brought from outside, if necessary.

Where excavated material is not considered suitable for refilling by the Engineer-in-charge, the Contractor will be required to cart selected surplus excavated materials in place of unsuitable materials. The contractor may also be instructed to supply suitable granular or other hard filling material for use in refilling. Such imported filling material shall be paid for at the rates given in the Bill of quantities.

No payment shall be made for carting away surplus material arising either because of rejection of excavated material for refilling or because of surplus material.

Measurement:

The contractor's shall be for the unit of one cubic meter of the quantity excavated limited to the dimensions and provisions specified in the specifications or as directed by the Engineer-in-charge. The extra excavation to provide for jointing pipes, shoring etc. will not be paid for. The rates shall include cleaning and clearing the trench site by cutting grass, shrubs and trees of girth (circumference) not exceeding 10 feet and removing their obstructing roots in the trench cleaning the site, setting out works as per sanctioned plans, provide shoring, excavation and removal of all material from trenches, backfilling the trenches up to natural ground level and all other operations described above. The wood obtained during site clearance shall be the property of the department concerned.

The excavated quantity divided into two sub groups

Excavations up to depth of 1.5M

The trench section is to be provided with Max. width OD of pipe + 250mm to 300mm either sides. Depth of trench shall be minimum Bedding + OD of pipe + 0.60mt. cover above the top of pipe. (For 100mm dia pipe). Depth of trench shall be minimum Bedding + OD of pipe + 1.0mt. cover above the top of pipe. (For Other dia pipe).

Mode Of Measurement And Payment:

The rate shall be per Cubic Meter of excavation.

ITEM NO.2: SAND BEDDING

Supply & Laying of Bhogavo Sand with all required material and labour for pipe Bedding etc comp.

Pipe bedding of minimum 150 mm thickness and level shall be provided below pipe, prior to laying the pipe in trenches. It shall be compacted with a light hand rammer. Any reduction in thickness due to compaction shall be made up by adding sand during ramming. For the purpose of the bedding under this item only screened fine sand of grain size not larger than 2mm shall be used. The sand shall be clean, uncoated and free from clay lumps, injurious amounts of dust, soft particles, organic matter, loam or other deleterious substances.

If the sand supplied is unclean it shall be washed. In no case shall sand containing more than 3.5 % by dry volume or 5% by wet volume of clay, loam or silt be accepted. Tests specified for determining silt in sand and organic impurities as described in IS: 383 shall apply. Sieved and washed sand shall be stored on the works in such a manner as to prevent intrusion of any foreign matter, including coarser particles of sand or any clay or metal or chips. Tests as indicated above shall be performed if called for by the Engineer at the expense of the Contractor.

During the work of providing sand bedding and laying the pipeline over it, loose material from the sides or edges of the trench shall be prevented from falling inside the trench, by providing shoring and taking other measures. Also where necessary, trench shall be kept dry by pumping out seepage water continuously.

ITEM NO.3: EARTH FILLING(Selected Excavated Stuff) FOR BEDDING

Providing, Bedding Incl. Ramming, Watering Consolidating Etc.

3.1) Material To Be Used From Selected Excavated Stuff.

The selected excavated stuff shall be got proved from the engineer in charge before using the same for providing bedding on trenches bed. Big clods shall be broken into small pieces and tree roots, weeds and big stone and other objectionable material decay shall not be used in the work.

The bedding shall be placed uniformly with minimum thickness (as per instruction) Along the routes of excavated pipe trench as directed by the engineer-in-charge. The bedding shall be properly rammed watered and consolidated.

The mode of Measurement.

The quantity of the work shall be paid on cum. Of the completed bedding after Proper consolidation & watering.

ITEM NO.4: REMOVING SURPLUS MATERIALS:

After refilling all surplus excavated stuff shall have to cart by the contractor within RMC limit including loading, transporting, unloading, spreading etc complete as directed by the Engineer-in-Charge. without any extra cost

Mode Of Measurement And Payment:

The rate shall be per Cubic Meter of truck-body bases.

ITEM NO.5 & 6:

ITEM NO. 5:-CC Excavtion Work :

Excavation of CC Road (Except for road works) with removing of Excavated material as directed by in-charge Engineer etc comp.

Excavation shall be in C.C. road may be carried out either with hand breaker for pipeline trenches including all safety Provision using the site rails and stacking excavated stuff up to a lead of 90 mts cleaning the site etc. complete for lifts and strata is specified. Classification is decided by engineer in charge. The rate includes the cost of labour, tools, machinery etc.

Payment shall be measure in Cubic meter basis.

ITEM NO. 6:- Paver Excavation Work :

Excavation shall be in macadam(paver) road may be carried out either with hand breaker for pipeline trenches including all safety Provision using the site rails and stacking excavated stuff up to a lead of 90 mts cleaning the site etc. complete for lifts and strata is specified. Classification is decided by engineer in charge. The rate includes the cost of labour, tools, machinery etc.

Payment shall be measure in square meter basis.

Item No.7:

Providing & Supplying Ductile Iron Pipes with internal cement mortar lining and external Zinc coating with finishing layer of Bitumen; manufactured, tested and duly marked in strict accordance with and confirming to IS: 8329/2000 (as per latest amendment); suitable for push-on Jointing, along-with one number Rubber Gaskets for each length of pipe (EPDM Gasket as per IS: 5382/1985). Class- K9 etc comp.

Item No.9:

Ductile Iron fittings like, bends, tees, reducers or any other specials as per IS-9523-2000 (as per latest amendment) use with D.I.Pipes manufactured as per IS:8329/1994 (With external bitumen & zink coating & internal cement mortar lining)(300 mm to 400 mm and above). etc comp.

Note:

The DI Pipe shall be of cement mortar lining inside and zinc coating outside, bitumen coating as per manufacturing and testing IS 8329-2000 with ISI Mark suitable for pushup joint. All pipes with necessary EPDM Rubber Gasket (Rubber gasket IS-5382-1985) with existing Excise duty.

A] DUCTILE IRON PIPES & FITTINGS/ SPECIALS:

Note: Wherever International Standards or Indian standards / specifications are mentioned, their equivalent or higher standards / specifications are also acceptable

Supply and Delivery of Ductile Iron Pipe as per IS: 8329-2000 & IS 9523/2000 DI fittings or its latest revision or amendments if any including jointing material as EPDM ring as per IS 5382-1985 and ISO: 4633-1996 or its latest revision or amendments if any.

Standards

The following standards, specifications and codes are part of this specification. In all cases, the latest revision of the including all applicable official amendments and revisions shall be referred to. In case of discrepancy between this specification and those referred to herein, this specification shall govern.

- 1) ISO: 10803-1997 Design method for ductile iron pipes
- 2) IS:8329-2000 Centrifugally Cast (spun) ductile iron pressure pipes for water, gas and sewage & IS 9523 for DI Fittings/Specials.
- 3) ISO:2531-1991 Ductile iron pipes, fittings and accessories for pressure pipelines.

- 4) ISO:4179-1985 Ductile iron pipes for pressure and non pressure-Centrifugal cement mortar lining – General requirements.
- 5) IS:8112 Specification for 43 Grade ordinary Portland cement.
- 6) BS:3416 Bitumen based coatings for cold application, suitable for use in contact with potable water.
- 7) ISO:8179-1995 Ductile iron pipes-External coating-Part-1 Metallic Zinc with finishing layer.
- 8) IS:638 Sheet rubber jointing and rubber insertion jointing.
- 9) ISO:4633-1996 Rubber seals-Joint rings.
- 10) IS:5382-1985 Specification for Rubber sealing rings for gas mains, water mains and sewers.
- 11) AWWA C600 Installation of ductile iron water mains and their appurtenances.

1.0 Internal Diameter:

The nominal values of the internal diameters of pipe, expressed in millimeters are approximately equal to the number indicating their nominal sizes DN.

2.0 Length:

The working length of socket and spigot pipes shall be 5 m ,5.5 m, or 6 metres.

3.0 Thickness:

The wall thickness of pipe 'e' in mm shall be calculated as a function of the nominal diameter by the following equation with minimum of 5 mm

$$e = K(0.5 + 0.001 \text{ DN})$$

where : e = wall thickness in mm, DN = the nominal diameter, K = the whole number coefficient

4.0 EPDM Rubber Gasket:

Rubber Gasket shall be suitably for Push-on-Joint.

The spigot ends shall be suitably chamfered or rounded off to facilitate smooth entry of pipe in the socket fitted with the rubber gasket

Rubber Gasket shall confirm to IS 5382-1985 and ISO : 4633-1996 its latest revision or amendments if any

5.0 Sampling Criteria:

Sampling criteria for various tests, unless specified in IS 8329-2000, shall be as laid down in IS 11606. Mechanical test, Brinell Hardness test, Hydrostatic test etc are shall be as per IS 8329-2000

6.0 Tolerances on External Diameter:

The nominal external diameter (DE) of the spigot end of socket and spigot pipes and when measured circumferentially using a diameter tape shall confirm to the requirements specified as follow. The positive tolerance is +1 mm and applies to all thickness classes of pipes. The maximum negative tolerance of the external diameter are specified as follow:

DN	Nominal	Positive Tolerance	Negative Tolerance
80	98	+1	-2.2
100	118	+1	-2.8
125	144	+1	-2.9
150	170	+1	-3.0
200	222	+1	-3.0
250	274	+1	-3.1
300	326	+1	-3.3
350	378	+1	-3.4
400	429	+1	-3.5
450	480	+1	-3.6
500	532	+1	-3.8
600	635	+1	-4.0

7.0 Tolerance on Ovality:

Pipes shall be as far as possible circular internally and externally. The tolerance for out-of-roundness of the socket and spigot ends is given below:

Nominal Diameter in mm	Allowable Difference Between Minor Axis and DE in mm
80 to 300	1.0
350 to 600	1.75
700	2.0
750 to 800	2.4
900 to 1000	3.5

8.0 Tolerance in thickness

The tolerance on wall thickness (e) and the flange thickness (b) of the pipes shall be as below:

Dimensions	Tolerance in mm
Wall thickness (e)	- (1.3 + 0.001 DN)1)
Flange thickness (b)	+ (2+0.05b) & - (2+0.05b)

9.0 Coating

Pipe shall be delivered internally and externally coated.

External Coating: Pipe shall be metallic zinc coated and after that it shall be given a finishing layer of bituminous paint as per IS - 8329-2000 Zinc coating shall comply with IS:8329/EN 545/ ISO 8179. Only molten zinc spray coating shall be acceptable. The average mass of sprayed metal shall not be less than 130 g/sqm with a local minimum of 110 g/sqm. Bitumen overcoat shall be of normal thickness of 70 microns unless otherwise specified. It shall be a cold applied compound complying with the requirements of BS 3416 Type II suitable for tropical climates factory applied preferably through an automatic process.

Damaged areas of coating shall be repainted on site after removing any remaining loose coating and wire brushing any rusted areas of pipe.

Internal lining: Internally pipe shall be Portland Cement mortar lined (as per IS - 8329-2000). The mortar shall contain by mass at least one part of cement to 3.5 part of sand. All pipes and fittings shall be internally lined with cement mortar using high speed centrifugal process in accordance with IWO 4179/IS 8329. Cement mortar lining shall be applied at the pipe manufacturing shop in conformity with the aforesaid standards. No admixtures in the mortar shall be used without the approval of the Engineer. The sand to cement proportion of sand if justified by the sieve analysis. Pipe lining shall be inspected on site and any damage or defective areas shall be made good to the satisfaction of the Engineer. Lining shall be uniform in thickness all along the pipe. The minimum thickness of factory applied cement mortar lining shall be as per IS: 8329 Annex-B or ISO 4179. This is given below.

Nominal Pipe Size (mm)	Nominal lining thickness (mm)
Up to 300	3
350-600	5
700-1200	6
1400-2000	9

10.0 Joint

Jointing of DI pipes and fittings shall be push-on type

Push-on-joints

The Contractor shall source the push-on-joint gaskets only from the pipe manufactures. In turn the pipe manufacturer shall supply at least 10% additional quantity of gaskets over and above the requirement to the Contractor at no extra cost. The gasket used for joints shall be suitable for natural and purified water conveyance. In jointing DI pipes and fittings, the Contractor shall take into account the manufacturer's recommendations as to the methods and equipments to be used in assembling the joints. In particular the Contractor shall ensure that the spigot end of the pipe to be jointed is smooth and has been properly chamfered, so that once the rubber ring is correctly positioned before the joint is made, does not get damaged by friction or sharp edges of the spigot Chamfer. The rubber rings and the recommend lubricant shall be obtained only through the pipe manufacturer.

Rubber ring bundles from every lot shall carry with them manufacturer's test certificate for the following mechanical properties.

1. Hardness
2. Tensile strength
3. Compression set
4. Accelerated aging test
5. Water absorption test
6. Stress relaxation test

Rubber rings shall be clearly labeled in bundles to indicate the type of ring, the type of joint, the size of the pipe with which they are to be used, the manufacturer's name and trade mark, the month and year of manufacture and the shelf life.

11.0 Testing of Pipe:

The main test among others to be conducted shall be as per IS:8329-2000 or with its latest revision/amendments.

[a] Mechanical Tests

Mechanical tests shall be carried out during manufacture of pipes as specified in the Standards. The frequency and sampling of tests for each batch of pipes shall be in accordance with IS 11606-1986. The test results so obtained for all the pipes and fittings of different sizes shall be submitted to Engineer. The method for tensile tests and the minimum tensile strength requirement for pipes and fittings shall be as per IS:8329/EN 545 for pipes and IS:9523/EN 545 for fittings.

[b] Brinell Hardness Test

For checking the Brinell hardness the test shall be carried out on the test ring or bars cut from the pipes used for the ring test and tensile test in accordance with IS:1500. The test shall comply with the requirements specified in IS:1500/ISO 6506.

[c] Re-tests

If any test piece representing a lot fails in the first instance, two additional tests shall be made on test pieces selected from two other pipes from the same lot. If both the test results satisfy the specified requirements the lot shall be accepted. Should either of these additional test pieces fail to pass the test, the lot shall be liable for rejection.

[d] For hydrostatic test at works, the pipes and fittings shall be kept under test pressure as specified in the standard for a period of minimum 15 seconds during which the pipes shall be struck moderately with a 700 g hammer for confirmation of satisfactory sound. They shall withstand the pressure test without showing any leakage, sweating or other defect of any kind. The hydrostatic test shall be conducted before surface coating and lining.

12.0 Quality Assurance

The manufacturer shall have a laid down **Quality Assurance Plan** for the manufacture of the products offered which shall be submitted along with the tenders and successful tendered shall have to get its approval from RMC. All the materials, pipe, specials, valves etc. shall have to be inspected through Third Party Inspecting Agency.

Mode of Payment : As per schedule B, R.M.C. will pay maximum 1000 meter un laid pipes supply payment restricted to 65 % of cost. 25 % will be released after on lowering, laying and jointing and 10% on satisfactory hydraulic test successful tests given after laying jointing.

ITEM NO.9: D. I. SPECIALS / FITTINGS :-

SPECIFICATION :

Supply of DI Specials, K-9 with ISI marked, conforming to IS 9523/2000 & BSEN:545/1995, suitable for jointing 150mm to 600mm dia. DI Pipes shall have the following :

A) EXTERNAL COATING :

1. Metallic Zinc with finishing layer of bituminous as per Annexure 'A' of IS: 9523/2000.
2. Zinc rich paint with finishing layer of bituminous as per Annexure 'A' of IS: 9523/2000.
3. Bituminous paint as per Annexure 'C' of IS: 9523/2000.

B) INTERNAL LINING :

1. Portland Cement (with or without additives) mortar as per Annexure – 'B' of IS: 9523/2000.
2. Cement Mortar with Coal coat as per Annexure 'B' of IS 9523/2000.
3. Bituminous paint as per Annexure 'C' of IS: 9523/2000.

C) METALURGY & MICRO STRUCTURE :

The metal used for manufacture of D.I. fittings as per IS : 9523-2000 shall conform to the appropriate grade as specified in IS : 1865-2005.

D.I. Fittings shall contain a Stub (as cast), minimum length -15mm x dia.- 10 mm., which at the time of Inspection can be cut at random to carry out Metallographic test to ascertain minimum 80% Graphite No dularity as per Clause – 9.1 of IS : 1865-2005, in the form - V or VI as per IS : 7754-2003.

D) MANUFACTURING & VERIFICATION:

All the DI fittings and specials shall conform to IS: 9523/2000 and shall be manufactured at well equipped foundries.

The QAP for the DI fittings shall include inspection of above two by Department's (/)senior technical representatives and shall necessarily require formal approval before manufacturing clearance.

Mode of Payment: As per schedule B but supply payment restricted to 65% of cost. 25 % after laying jointing and 10 % will be released after successful hydraulic tests etc complete.

ITEM NO.8.

Lowering, laying & jointing of Ductile Iron Pipes with CI / DI / MS special in proper position, grade and alignment as directed by engineer-in-charge etc comp. etc comp.

GENERAL:

The pipes & joints shall be procured, supplied by the Contractor at work site at his own cost. Every care shall be taken in carting them to site. During transportation any damage shall be occurring to pipes for fittings the replacement of pipes given by the contractor at his own cost.

The trenches shall be well leveled so that pipes are laid evenly along them. The contractor shall make his own arrangement for obtaining permission for storing & stacking of pipes etc.

Every pipes before lowering into the trenches shall be got checked and thoroughly cleaned and the beds of the trenches shall be properly graded and leveled as required on the line, without any claim for extra cost whether it is required. The pipe shall be carefully lowered into the trenches with the help of a suitable type of chain pulley blocks, which shall first be approved by the Engineer-in-Charge. Each pipe shall be properly jacked and the spigot perfectly fixed into the socket. No jointing operation shall be started unless the gradients levels are approved by the Engineer-in-Charge or his representatives.

The pipes shall be laid complete in centerline ranged accurately by means of a string attached to both marked center of site rails and no deviation shall be permissible without the permission of Engineer-in-Charge. The pipe shall be laid in reasonably dry trenches and no circumstances on slushy bedding.

The pipes shall be brushed before lowering any laying or remove any soil or dirt etc. that may have accumulated.

The inside socket and outside of the spigot shall be carefully cleaned. The pipe shall be lowered carefully with socket and toward and the flow of water or up till or as directed and spigot and should be carefully inserted into the socket and the space shall be filled with the joint.

DI specials shall be conforming to IS 9523-2000 and flanges shall be of PN-10 class.

PIPE CUTTING

For the installation of bends, branches and valves, pipelines require pieces of pipes of varying lengths. The exact length can only be determined on the site and one must be able to cut the pipes easily, quickly and safely.

CUTTING MACHINES

Today abrasive disc cutters with various kinds of power supply are used to cut ductile iron pipes. These cutters are powered by electric or compressed air connections or they can be driven indirectly by internal combustion engines. Many of the abrasive disc cutters in the market can be fitted with both abrasive cut off discs for cutting and with roughing discs for rounding off the cut edges. If only one machine is available on site then it should be suitable for both types of discs.

Stages in cutting operation

The pipe should be placed on level ground or on square timbers in such a way that during cutting, the cutting disc does not become jammed and the remaining pipe wall does not prematurely break away.

Marking : A line marked all around the pipe facilitates a straight cut. The line is simply drawn along a steel band which is bent around the pipe.

Cutting : Using the cutting disc, the ductile iron and cement mortar pipe wall is cut through completely at one point. The pipe is then cut along the marked line in a single operation.

Rounding off : For jointing into sockets of the push - on type, the new spigot end must be chamfered as the original spigot end. Only then the spigot end can be correctly inserted in the socket without damaging the gasket or pressing it out of its seat. A roughing disc is used for chamfering.

Re-coating : Subsequently, the bare metal surface should be recoated with zinc rich paint and a finishing layer of bitumen.

Marking the insertion depth : Before assembling the joint, lines should be marked on the new spigot, showing the correct insertion depth of the spigot end in the socket.

REFILLING OF TRENCHES:

On completion of the pipe laying operations in any section, for a length of about 100m and while further work is still in progress, refilling of trenches shall be started by the Contractor with a view of restricting the length of open trenches. Pipe laying shall closely follow the progress of Trench Excavation and the Contractor shall not permit unreasonably excessive lengths of trench excavation to remain open while awaiting testing of the pipeline. If the Engineer considers that the Contractor is not complying with any of the foregoing requirements, he may prohibit further trench excavation until he is satisfied with the progress of laying and testing of pipes and refilling of trenches. The excavated material nearest to the trench shall be used filling. Care shall be taken during backfilling, not to injure or disturb the pipes, joints or coating. Filling shall be carried out simultaneously on both sides of the pipes so that unequal pressure does not occur. Walking or working on the completed pipeline unless the trench has been filled to height of at least 30cm over the top of the pipe except as may be necessary for tamping etc., during backfilling work.

The remaining portion of the trench may be filled in with a mixture of hard and soft material free from boulders and clods of earth larger than 150mm in size if sufficient quantity of good earth and murrum are not available. The trench shall be refilled so as to build up to the original ground level, keeping due allowance for subsequent settlement likely to take place. The top 300mm layer or fertile agricultural soil shall be kept aside during excavation and shall be laid in layers near ground level during refilling.

To prevent buckling of pipe shell of diameters 1200mm and above, pipes shall be strutted from inside while the work of refilling is in progress, for which no separate payment shall be made.

Strutting shall be done by means of strong spiders having at least 6 arms which shall be sufficiently stiff to resist all deformation. Spiders shall be provided at a maximum interval of 2m & shall be welded in such a way that internal coating does not get burnt.

The Engineer shall, at all times, have powers to decide which portion of the excavated materials shall be for filling and in which portion of the site and in what manner it shall be so used.

If any material remains as surplus it shall be disposed of as directed by the Engineer, which includes loading, unloading, transporting and spreading as directed within all lead. If the Contractor fails to remove the earth from site within 7 days after the period specified in a written notice, the Engineer may arrange to carry out such work at the Contractor's risk and cost or may impose such fine for such omission as he may deem fit. Particular care shall be taken to keep the trench dry during the entire refilling operation.

If suitable material for refilling is not available for excavation the Contractor shall bring earth, murrum of approved quality as directed by the Engineer.

No mechanical plant other than approved compacting equipment shall run over or operate within the trench until backfilling has reached its final level or the approval of the Engineer has been obtained.

Subsidence in filling in: Should any subsidence take place either in the filling of the trenches or near about it during the maintenance period of 12 months from the completion of the Contract Works, the Contractor shall make good the same at his own cost or the Engineer may without notice to the Contractor, make good the same in any way and with any material that he may think proper, at the expense of the Contractor. The Engineer may also, if he anticipates occurrence of any subsidence, employ persons to give him timely notice of the necessity of making good the same, and the expenses on this account shall be charged to the Contractor.

TESTING OF WATER PIPES:

After each section of the pipeline has been completed it shall be tested for water tightness before being covered. The contractor shall at his own cost fill up water in pipe line and

given necessary hydraulic test section by section and the pipe line shall stand the pressure which shall stand the pressure which shall exceed the working pressure by

(a) 50% of the highest pressure in the section. (b) 30m whichever is less without showing any leakage or sweating anywhere in the pipes joints specials valves etc. if any defect are found the contractor shall be made good the same at his own cost. Any leaking joints shall be made good and above test pressure in to be lowered gradually after satisfactory test is & over. Municipal corporation will not be able to provide water for testing of the pipelines & water containers of the project. This shall have to be managed by the contractor at his costs and risk.

The hydraulic test shall be given again if considered necessary by the Engineer or his representative to show that no further leakages or sweating is there. The contractor shall have to make necessary arrangements for water testing as well as plugging the open the pipes etc. as directed without claiming any extra cost. The pipelines shall be kept filled with water for a work lines shall be kept filled with water for a week or till it is situated for testing is done.

If the pipe lines are laid in detached sanctioned & not in continuous length due to any reasons such as non availability of specials or due to obstacle etc. The contractor shall see that no end of pipes length is kept open-ends are immediately covered up either by suitable blank flange or cap slug or by means of double layer gunny bags clothes tied properly by mild steel wire without any claim for extra-cost.

The pipe laying across the state highways, national highways etc. will have to be done either through open cut method or through push through method depending upon the requirement to be prescribed by the sanctioning authority. However, mostly it would be push through method.

Mode of measurement and payments 90% on completion of laying & jointing & 10% on giving hydraulic test etc complete.

ITEM NO:10

Providing & supplying ISI mark C.I. D/F sluice valves, Reflux valve s offollowing class and diameteer incl. All taxes, insurance, transportation, Freight, Charges, Octroi, inspection charges, load- ing unloading, conveyance to departmental stores, stacking etc. complete (A) Sluice Valves as per IS mark only. WITH ISI MARK ONLY.

PN1.0

(I) 300mm dia

(II) 500MM dia

Sluice Valve

Sluice valve as per I.S: 14846

1.0 GENERAL

The contractor shall be covering manufacturing, supplying and delivery of:

Sluice valve conforming to IS: 2906-1984 & IS: 14846 or its latest revision (Specification for sluice valves (50 to 900 mm size) with ISI certification

2.0 STANDARDS

The C.I. sluice valves to be manufactured, supplied and delivered under the scope of this contract shall be manufactured in accordance with and conforming to Indian standard specifications as given below: with ISI certification mark on each sluice valves.

3.0 TEMPERATURE VARIATION

All sluice valves manufactured, supplied and delivered shall be subjected to drinking water under variable temperature condition ranging from 40 to 450 C.

4.0 MARKING

The legible and in deniable marking upon each valve shall indicate the following: (1)

- ISI certification mark on each sluice valve only.
- (2) Manufacture's brand name and/or trade mark.
- (3) Size of valve and nominal pressure of valve.
- (4) Serial number of cast.
- (5) Serial number in punch
- (6) Where a valve has been tested for only open and test, it should be marked '0' Distinctly and permanently.
- (7) Any other important matter that the manufacturer deems fit to be inscribed Embossed.

5.0 TEST CERTIFICATE

5.1 The contractor shall always provide manufacture's test certificate in accordance with every batch/ lot as valves so manufactured and supplied.

5.2 The contractor shall also produce; in addition to manufacture's test certificate the inspection certificate issued by the authorized person /agency appointed by Municipal Corporation for the same purpose. The inspection charges of the authorized person/agency as fixed by Municipal Corporation shall have to be borne by the contractor and the necessary payment to the inspecting agency shall be paid by the contractor as per the terms and condition of Municipal Corporation

6.0 NOMINAL PRESSURE

Sluice valves shall be designed by nominal pressure (PN) defined as the maximum permissible gauge working pressure in Mpa as "PN-II" (Mpa= 10 kgf/m² approx.)

The nominal size shall refer to the nominal bore at any point, shall not be less than the nominal size required.

Class of Valve	Working pressure of body	working pressure for seat
PN 0.6	5 kg/sq.cm	9 kg/sq.cm
PN 1.0	10 kg/sq.cm	15 kg/sq.cm
PN 1.6	16 kg/sq.cm	24 kg/sq.c

7.0 MATERIAL:

The materials for the different component parts of the sluice valve shall conform to requirements given in Table

Materials for components parts of sluice valve

Sr. No.	Component	Material	Ref. to	Grade	of designation
1	Body, bonnet wedge stuffing box, gland thrust plate, cap.				Grey cast iron 210-2009
2	Steam High	tensile brass	320-1980		Ally 1 of 2
3	Wedge nut	Leaded tin bronze			318-1981(3) 2
4	Body seat ring, wedge facing ring	Leaded tin bronze			318-1981(3) 2
5	Bolts	Carbon steel	1367-1967(4)		Class 4.6
6	Nuts	Carbon steel	1367-1967(4)		Class 4
7	Bonnet gasket	Compressed fiber Board			2712-1998(5) C
8	Gland packing	Jute & hemp	5414-1995(6)		--

- (1) Specification for grey iron castings (third revision).
- (2) Specification for high tensile brass rods and sections (revised). (3)
Specification for leaded tin bronze ingots and casting (revised).
- (4) Specification for technical supply condition threaded fasteners (first revision) (5)
Specification for compressed asbestos fiber jointing (first revision)
- (6) Specification for gland packing, jute and hemp.

8.0 MANUFACTURE

Sluice valve bodies for 80 mm to 900 mm size valves shall be provided with double flanged ends connection.

9.0 FLANGES

The flanges and their dimensions of drilling shall be in accordance with part IV and VI of I.S. 1538 (Part I to XXII) 1993 (Specification for cast Iron fittings for pressure pipes for water gas and sewage) or its latest revision.

10.0 TESTING:

10.1 Hydraulic test:

Each valve shall be subjected to hydraulic tests as described in Appendix – B of IS:

2906-1984 to the test pressure for a duration as specified in table – 7 of IS: 2906 and shall show no sign of leakage under these tests.

10.2 Liquid Penetration Test:

The forged steel stems shall not show any sign of flaw when subjected to liquid penetration flaw detection test in accordance with IS: 3658-1981.

11 Lowering and jointing in position

11.1 Supply of Material

11.1.1 Cast iron double-flanged sluice valve with two tailpieces suitable to pipe conforming to the latest relevant IS shall be supplied and carted by the contractor to the site of work including loading, unloading and stacking at site.

11.1.2 The sluice valve and tailpieces shall be examined before laying for cracks and other flaws. They shall be undamaged in all respect.

11.1.3 The sluice valves shall be cleaned before laying.

11.1.4 All grits and foreign materials shall be removed from the inside of the valves before placing.

11.1.5 All the four faces shall be thoroughly cleaned and coated with a thin layer of mineral grease.

11.1.6 The tightening of gland shall be checked with a pair of inside-calipers. Clearance between the top of stuffing box and the underside of the gland shall be uniform all the sides.

11.2 Jointing Material

11.2.1 The contractor shall provide all necessary jointing materials such as nuts bolts, rubber packing, white zinc, jute, lead wool etc.

11.2.2 All tools and instruments, which are to be required for installation of sluice valve shall be provided by the contractor.

11.2.3 All jointing materials shall be got approved from the engineer-in-charge before use the nuts and bolts shall conform to the relevant IS. The rubber packing shall conform all specifications as narrated in respective IS.

11.3 Installation

11.3.1 The sluice valve shall be lowered in to the trench carefully, so that no part is damaged during lowering operation.

11.3.2 If necessary tailpieces shall be fitted with sluice valve first outside the trench and then lowered in to the trench.

11.3.3 The rubber packing shall be three ply and of approved thickness. The packing shall be of full diameter of the flange with necessary holes and the sluice valve bore. It shall be even at both the inner and outer edges.

11.3.4 The flange faces thoroughly greased.

11.3.5 If flange faces are not free, the contractor shall use thin fibers of lead wool.

11.3.6 After placing the packing, nuts and bolts shall be inserted and tightened to make the joint.

11.3.7 The valve shall be tightly closed when being installed to prevent any foreign materials from getting in between the working parts of the valve.

11.3.8 Each flange bolt shall be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively.

11.3.9 The sluice valve shall be installed in such a way that its Spindle shall remain in truly Vertical position.

11.3.10 The other end of tailpiece shall be fitted with pipes so that continuous lines can work.

11.3.11 Extra excavation required for facility of lowering and fixing sluice valve shall not be paid for.

11.4 Testing

11.4.1 After installation of sluice valve the same is tested to 1½ times of its test pressure.

11.4.2 The joints of sluice valve shall withstand the test pressure of pipelines.

11.4.3 Defects noticed during test and operation of sluice valve shall be rectified by the contractor at his own cost without any extra claim to the entire satisfaction of the Engineer-in-charge.

12.0 Measurement and payment:

The payment shall be made on cum. of completed work including all operations and final finishing.

ITEM NO. 12: TEMPER PROOF AIR VALVE WITH ISOLATING SLUICE VALVE

Providing and supplying of 150 mm dia. C. I. Temper proof Air valves with SS 304 Float gun metal- nozzle of approved make & quality of following class and diameter including all taxes, insurance, transportation, freight charges, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. complete.(With Isolating Sluice Valve PN 1.6)

Tamper Proof Air Valves shall be cast iron body, cover and cowl. Temper Proof Air valve working temperature shall be upto 50° C.

Design and Manufacturing Code - AWWA C512

Hydraulic Test Pressure shall be as mentioned below.

Sr. No.	Rating	PN 1.0	PN 1.6	PN 2.0	Duration
1	Body Test	15 Kg/ cm ²	24 Kg/ cm ²	20 Kg/ cm ²	5 Min
2	Seat Test	10 Kg/ cm ²	16 Kg/ cm ²	30 Kg/ cm ²	2 Min

Material of Construction

Sr. No.	Component	MOC for PN 2.0 Rating	MOC for PN 1.0 / 1.6 Rating
1	Body, Cover	Graded Cast Steel ASTM A216 Grade WCB	CI. IS 210 FG260
2	Float	Stainless Steel 304	
3	Seat	Nitrile Rubber	
4	Nozzle	Bronze-LTB 2	
5	Bolts and Nuts	SS 304	
6	Gasket	Rubber , Type B (As per IS 638)	

Inspection and Testing

- The Engineer-in-charge or his authorized representative shall have free access to the works for inspection at any stage of manufacture and to reject any materials, which does not confirm to the specified requirements.
- The manufacturer shall arrange to supply all labour and appliance for the tests if the testing is to be done at his works. Each valve shall be subjected to the hydraulic test and shall show no sign of leakage under these tests, i.e. the balls shall function properly. The valve shall be tested to double the maximum working pressure.

Manufacturer's Guarantee

The manufacturers shall guarantee that if any defects chargeable to faulty workmanship, design or materials are found in the valves within a period of one year of dispatch be shall replace any part that prove defective, free of charge at the place of dispatch.

Information Required

The following information shall be cast on each valve body:

- (a) Manufacturer's name or trademark.
- (b) Size of valve

Marking

The methods of marking all the valves to be delivered under scope of contract shall ensure that all the information will remain legible even after transportation, storage in open space etc. In general the legible and indelible marking upon the valves shall indicate the followings:

- a) Manufacture's brand name and/or trademark
- b) Diameter and class of valves
- c) Any other important matter that the manufacturer or purchase deems fit to be inscribed

Packing and Handling

- The materials shall always be packed separately dispatched from manufacturer's works with adequate protective measures to prevent damages deterioration while in transport or stored at any place. The packing shall always be so neat and tidy that may withstand any robust and rough handling.
- When the materials are transported at railway risk, special packing as per IRCA rules are absolutely necessary for which the extra cost, if any, shall be borne in total by supplier only.

- The supplier shall use proper handling instruments/equipment's and shall follow to a suitable method of handling pipes as may be approved by Engineer, while unloading and stacking material in the stores.

Materials and Workmanship

- General requirements of materials and workmanship shall mean any material or article either raw or finished one is required to be used in the manufacturing process of tanks.
- All the material shall be new and of high quality.
- In case, if material is not specified by relevant ISS for manufacturing part or the whole as item, the supplier shall prepare specifications in concurrence with manufacturer and shall seek an approval of Engineer prior to its use in the manufacture.

Test Certificate

- The supplier shall always provide manufacturer's test certificate in accordance with every batch/lot of goods so manufactured and supplied.
- The supplier shall also produce in addition to manufacturer's test certificate as mentioned under "inspection & testing above", the inspection certificate issued by the employer or his authorized person / agency appointed.

Inspection

This clause is applicable in general to all materials such as all types of valves, pre-cast chambers, other specials and materials etc. which are to be supplied by the contractor.

Inspection of materials will be carried out at factory site by Rajkot Municipal Corporation or authorized person / agency appointed by Rajkot Municipal Corporation.

The inspection call for Air Valves should be given. Inspection will be carried out normally within one weeks time and on receipt of such intimation the inspecting agency will inspect the materials as per the specification and on satisfying itself, will mark the inspection marks on all pipes and issued inspection note to the supplier and concerned consignee.

For inspection purpose the manufacture has to go in for stenciling for identifying size and class for proper segregation. The stock of offered material shall be in a manageable batch with adequate space like spreading the pieces etc. to permit proper inspection and inspection authority to be present during stamping so as to ensure that only actually cleared material is stenciled. Manufacturer does not load material after sunset to avoid inadvertent dispatch of wrong material.

Inspection note issued by the inspection agency to supplier as well as consignee (Concerned Executive Engineer) materials with inspection mark will be dispatched

to stores stipulated in supply order and on receipt at stores the verification will be carried out by concerned Deputy Executive Engineer as regards quantity and quality. Here quality means physical soundness of materials as precaution against breakage during transit. The supplier has to submit the test certificate as well as detailed test results carried out by inspection authority to the consignee along with the dispatch documents of materials. The material shall be considered as received only on receipt given by the concerned Deputy Executive Engineer after verifying and satisfying the above requirements.

ITEM NO. 11,13 and 15 :

ITEM NO 11 - Lowering, Laying, Jointing of ISI mark D.I / C.I. Sluice valve in position including cost of all labour ,jointing material, including bolts and giving satisfactory hydraulic testing etc. complete

ITEM NO 13 - Lowering, laying and jointing of 150 mm dia. C. I. Temper proof Air valves in position, including cost of all labour, jointing material, including nut bolts and giving satisfactory hydraulic testing, etc. complete. (Air valve double ball flanged)(With Isolating Sluice Valve PN 1.6)

ITEM NO 15 - Lowering, Laying, Jointing in position of 300 mm dia. D.I. Scour valve including cost of all labour ,jointing material, including bolts and giving satisfactory hydraulic testing etc. complete

FIXING OF SLUICE VALVES/BUTTERFLY VALVES:

Fixing double flange cast iron sluice valves including loading, unloading, carting from store to site including all jointing materials and testing etc, complete.

The sluice valves and tail pieces shall be examined before laying for cracks and other flows. They shall be undamaged in all respect.

The sluice valve shall be operated before laying.

All grits and foreign material shall be removed from the inside of the valves before placing.

All the four faces shall be thoroughly cleaned and coated with a thin layer of mineral grease.

The tightening of gland shall be checked with a pair of inside calipers. Clearance between the top of the stuffing box and the underside of the gland shall be uniform on all the sides.

Jointing materials:

The contractor shall provide all necessary jointing materials such as nuts bolts, rubber packing, white zinc, jute, lead, wool etc.

All tools and plant required for installation of sluice valve shall be provided by the contractor.

All jointing materials shall be got approved from the Engineer-in-charge before use.

The nut and bolts shall conform to latest I.S.S.

The rubber packing shall be good quality and approved by the Engineer-in-charge of the work.

Installation:

The sluice valve shall be lowered into the trench carefully, so that no part is damaged during lowering operation.

If necessary tail pieces shall be fitted with sluice valve first outside the trench and then lowered into the trench.

The rubber packing shall be three ply and of approved thickness. The packing shall be of full diameter of the flange with necessary holes and the sluice valve bore. It shall be even at both the inner and outer edges.

The flange faces thoroughly greased.

If flange faces are not free, the contractor shall use thin fibers of lead wood.

After placing the packing nuts and bolts shall be inserted and tightened to make the joints.

The valve shall be tightly closed when being installed to prevent any foreign materials from getting in between the working parts of the valve.

Each flange bolts shall be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively.

The sluice valve shall be installed in such a way that its spindle shall remain in truly vertical position.

The other end of tail piece shall be fitted with pipes so that continuous lines can work.

Extra excavation required for facility of lowering and fixing of sluice valve shall not be paid for.

Testing:

After installation of sluice valve the same is tested to 1 ½ times of its test pressure.

The joints of sluice valve shall withstand the test pressure of pipe line.

Defects noticed during test and operation of sluice valve shall be rectified by the contractor at his own cost without any extra claim to the entire satisfaction of the Engineer-in-charge.

Mode of measurement and payment:

The measurement shall be taken **per number of sluice valve** of specified size. The rate will be **per number** fitted in a pipe line.

30 percent of amount shall be withheld for hydraulic test and same shall be released after satisfactory hydraulic test.

FIXING OF AIR VALVES:

Fixing of cast iron air valve including loading, unloading carting from store to site, drilling and treading, wherever necessary including all jointing materials testing etc. complete.

The air valve shall be opened out cleaned and greased and checked properly before fixing.

Before fixing the air valve shall be observed for any damage during transit.

Jointing Materials:

The contractor shall provide all jointing materials such as G.I. Nipple, M.S. Clamps, nuts, bolts grease white zinc, rubber packing etc.

All tools and plant required for fixing air valves shall be provided by the contractor.

All the jointing materials shall be got approved from the Engineer-in-charge before use.

The nuts and bolts shall conform to latest I.S.S

The rubber packing shall be of good quality and approved by the engineer-in-charge of the work. It shall be three ply of approved thickness. The packing shall be of full diameter of flange with necessary holes and control valve bore. It shall be of even thickness of both inner and outer edges.

M.S. clamps shall be in two semi-circular pieces out of two coupling welded, suitable to the threads and size of single acting air valve.

Fittings:

The air valve shall be lowered into the trench, carefully, so that no part is damaged during lowering operation.

Double acting air Valve

The flanges of the air valve and tail pieces or pipe shall be properly cleaned and greased or applied with white zinc.

The rubber packing of approved quality and of required size shall be inserted on faces of air valve.

If flange faces are not true the contractor shall use thin fiber of lead wool at his own cost.

After placing the rubber packing the nuts and bolts shall be inserted and tightened evenly on all sides properly.

Each bolt shall be tightened a little at a time taking care to tighten diametrically opposite holes alternatively.

Testing:

The air valve shall be tested during the testing of the pipe line.

The joints and air valve shall be water tight.

During test if the joint or air valve, found leaking, the same shall be re-done to the entire satisfaction of Engineer-in-charge.

Mode of measurement of payment:

The measurement shall be size wise per number and payment shall be made per number of air valve fitted.

30 percent of amount shall be withheld for hydraulic test and shall be released after satisfactory hydraulic test.

In case of zero velocity valves, Air cushion valves & pressure relief valves shall be tested while running of the pipe line.

The measurement shall be taken for number of valve of specified size 30%

Amount shall be withheld for hydraulic test and same shall be released after satisfactory hydraulic test.

ITEM NO. 14:

Supply, installation, satisfactorily testing & commissioning of 200 mm dia. CI Scour valves with all accessories as per specs & drawings etc comp.

Scour valves are located at low points or between valved sections of the pipeline. Their function is to allow periodic flushing of the lines to remove sediment and to allow the line to be drained for maintenance and repair work.

The scour valve should be sized to allow a minimum scour velocity of 0.6 m/s to be achieved in the main pipe. Scour tees over required size should be offset tees to allow the debris to be taken from the invert of the pipe. Scour valve should be as per IS and make should be from approved vendor list and after approval from Rajkot Municipal Corporation authority.

Manufacturer's Guarantee

The manufacturers shall guarantee that if any defects chargeable to faulty workmanship, design or materials are found in the valves within a period of one year of dispatch be shall replace any part that prove defective, free of charge at the place of dispatch.

Information Required

The following information shall be cast on each valve body:

- (a) Manufacturer's name or trademark.
- (b) Size of valve

Marking

The methods of marking all the valves to be delivered under scope of contract shall ensure that all the information will remain legible even after transportation, storage in open space etc. In general the legible and indelible marking upon the valves shall indicate the followings:

- d) Manufacture's brand name and/or trademark
- e) Diameter and class of valves
- f) Any other important matter that the manufacturer or purchase deems fit to be inscribed

Packing and Handling

The materials shall always be packed separately dispatched from manufacturer's works with adequate protective measures to prevent damages deterioration while in transport or stored at any place. The packing shall always be so neat and tidy that may withstand any robust and rough handling.

When the materials are transported at railway risk, special packing as per IRCA rules are absolutely necessary for which the extra cost, if any, shall be borne in total by supplier only.

The supplier shall use proper handling instruments/equipment's and shall follow to a suitable method of handling pipes as may be approved by Engineer, while unloading and stacking material in the stores.

Materials and Workmanship

- General requirements of materials and workmanship shall mean any material or article either raw or finished one is required to be used in the manufacturing process of tanks.
- All the material shall be new and of high quality.
- In case, if material is not specified by relevant ISS for manufacturing part or the whole as item, the supplier shall prepare specifications in concurrence with manufacturer and shall seek an approval of Engineer prior to its use in the manufacture.

Test Certificate

- The supplier shall always provide manufacturer's test certificate in accordance with every batch/lot of goods so manufactured and supplied.
- The supplier shall also produce in addition to manufacturer's test certificate as mentioned under "inspection & testing above", the inspection certificate issued by the employer or his authorized person / agency appointed.

Inspection

This clause is applicable in general to all materials such as all types of valves, pre-cast chambers, other specials and materials etc. which are to be supplied by the contractor.

Inspection of materials will be carried out at factory site by Rajkot Municipal Corporation or authorized person / agency appointed by Rajkot Municipal Corporation.

The inspection call for scour valve should be given. Inspection will be carried out normally within one weeks time and on receipt of such intimation the inspecting agency will inspect the materials as per the specification and on satisfying itself, will mark the inspection marks on all pipes and issued inspection note to the supplier and concerned consignee.

For inspection purpose the manufacture has to go in for stenciling for identifying size and class for proper segregation. The stock of offered material shall be in a manageable batch with adequate space like spreading the pieces etc. to permit proper inspection and inspection authority to be present during stamping so as to ensure that only actually cleared material is stenciled. Manufacturer does not load material after sunset to avoid inadvertent dispatch of wrong material.

Inspection note issued by the inspection agency to supplier as well as consignee (Concerned Executive Engineer) materials with inspection mark will be dispatched to stores stipulated in supply order and on receipt at stores the verification will be carried out by concerned Deputy Executive Engineer as regards quantity and quality. Here quality means physical soundness of materials as precaution against breakage during transit. The supplier has to submit the test certificate as well as detailed test results carried out by inspection authority to the consignee along with the dispatch documents of materials. The material shall be considered as received only on receipt given by the concerned Deputy Executive Engineer after verifying and satisfying the above requirements.

ITEM NO. 16- C.C. WORK for THRUST BLOCKS & PIPE ENCASING

Providing CC work 1:2:4 for Thrust Block using aggregate of size 10-20 mm, centering, curing, finishing etc. complete (without reinforcement)

Anchorage in the form of a thrust block at each deflection in the horizontal and/or in vertical alignment of the pipeline shall be provided as per the design requirements to resist any unbalanced pressure at the bends. Gravity type thrust blocks shall be provided at horizontal and vertical deflections in the pipeline, which shall be designed according to the test pressure and the soil conditions at the site of the thrust block. Before designing the thrust blocks the Contractor shall assess the stability of the soil considering erosion due to wind and water. The general guidelines to be followed for providing and designing of thrust blocks shall be as under:

- The thrust blocks may not be required for bend angles up to 5%. However, necessary calculations shall be submitted by the Contractor for approval by Employer to establish that the thrust shall be taken care by pipe itself and that it is safe not to have the thrust block.
- The thrust shall be designed according to the field test pressure of the pipe.
- For above ground pipelines, thrust blocks shall be designed to take 100% thrust.
- For buried pipelines, thrust blocks on continuous pipe line sections shall be designed considering 50% thrust to be taken by block and balance by pipe as per CPHEEO manual.
- For buried pipelines, thrust blocks near valve chambers and/or any other dismantling joints shall be designed to take 100% thrust.
- In rock the passive pressure of rock shall be considered for thrust block design.

The thrust blocks shall be of concrete M20, cast in-situ, with minimum surface reinforcement of 5 kg/m². No formwork is required to be used for construction of thrust blocks in buried conditions, unless desired by the Contractor. The calculations for the dimensioning and the shape of the thrust blocks shall be approved by the Employer.

Anchor blocks shall also be located wherever there is a transition between above ground and buried pipelines. All such anchor blocks shall have flexible joints at either end to allow for small amounts of settlement to occur.

The Contractor shall construct the thrust blocks/Pipe Encasing as early in the program of work as is practical, and at least six months prior to installation of the above ground pipeline in order to reduce the risk of settlement imposing additional loads on the pipeline supports. All thrust blocks are to be completed on each section before the sectional hydraulic testing is conducted.

Where possible, the base of the thrust block shall be cast against solid rock in order to prevent any settlement. Any material overlying the rock shall be excavated and replaced with class M15 mass concrete. In the event of no rock being encountered, the base of the thrust block shall be cast against undisturbed ground. Any ground, which in the Employer opinion is unsuitable, shall be excavated and replaced with class M15 mass concrete.

The rate shall be for a unit of one cubic meter.

VALVE CHAMBER

Valve chambers shall be constructed according to approved drawings suitable for the respective valve. They shall be constructed as described in BOQ. The chambers shall be constructed after the laying of the pipes and the assembly of specials and valves. The size of the chambers shall be according to the following criteria/ as per direction of Employer.

Minimum distance of flanges from walls	:	30 cm
Minimum distance of sockets from walls	:	30 cm
Minimum distance between highest point of equipment and roof slab	:	30 cm

Pipes passing through walls should be coated by two layer of soft material (hessian felt) to allow for differential settling and longitudinal expansion if directed by Employer. Only metallic pipes may be cast into the walls for anchoring purposes.

ITEM NO. 17 - BRICK WORK

Brick work using common burnt clay building brick having crushing strength not less than 35 kg/Sqcm in foundation and plinth in cement mortar 1:6 (1 cement : 6 sand) etc comp.

Materials: Water shall confirm to M-1 and Cement shall confirm to M-3.

Brick:

The bricks shall be hard or machine moulded and made from suitable soils and burnt. They shall be free from cracks and flaws and nodules of free lime. They shall have smooth rectangular faces with sharp corners and shall be of uniform colors.

The bricks shall be moulded with a frog of 100 mm x 40 mm and 10 mm to 20 mm deep on one of its flat sides. The bricks should not be broken when thrown on the ground from a height of 600 mm.

The size of modular bricks shall be 190 mm x 90 mm x 90 mm.

The size of the conventional bricks shall be as under:

(9" x 4.3/8" x 2,3/4") 225 x 110 x 75 mm

Only bricks of one standard size shall be used in one work. The following tolerances shall be permitted in the conventional size adopted in a particular work.

Length $\pm 1/8"$ (3mm) width : $\pm 1/16"$ (1.5mm)

Height: $\pm 1/16"$ (1.5 mm)

The crushing strength of the bricks shall not be less than 35 kg/sq.cm. The average water absorption shall not be more than 20 percent by weight. Necessary tests for crushing strength and water absorption etc., shall be carried out as per IS: 3495 (Part I to IV) - latest edition.

Workmanship:

Proportion:

The proportion of the cement mortar shall be 1:6 (1-Cement, 6-Fine sand) by volume.

Wetting of bricks:

The bricks required for masonry shall be thoroughly wetted with clean water for about two hours before use or as directed. The cessation of bubbles, when the bricks are wetted with water is an indication of thorough wetting of bricks.

Laying:

Bricks shall be laid in English bond unless directed otherwise. Half or cut bricks shall not be used except when necessary to complete the bond; closer in such case shall be cut to required size and used near the ends of walls.

A layer of mortar shall be spread on full width for suitable length of the lower coarse. Each brick shall first be properly bedded and set frame by gently tapping with handle of trowel or wooden mallet. It's inside face shall be flushed with mortar before the next brick is laid and pressed against it. On completion of coarse the vertical joints shall be fully filled from the top with mortar.

The work shall be taken up truly in plumb. All coarses shall be laid truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate coarse shall generally be directly one over the other. the thickness of brick coarse shall be kept uniform.

The brick shall be laid with frog upwards. A set of tools comprising of wooden straight edges, mason's spirit level, square half meter rub, and pins, string and plumb shall be kept on site of work for frequent checking during the progress of work.

Both the faces of walls of thickness greater than 23 cms shall be kept in proper

place. All the connected brick work shall be kept not more than one meter over the rest of the work. Where this is not possible, the work shall be raked back according to bond (and not left toothed) at an angle not steeper than 45 degrees.

All fixtures, pipes, outlets of water, hold fasts of doors and windows etc. which are required to be built in wall shall be embedded in cement mortar.

Joints:

Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not expose 12 mm. The face joints shall be raked out as directed by raking tools daily during the progress of work when the mortar is still green so as to provide key for plaster or pointing to done.

The face of brick shall be cleaned the very day on which the work is laid and all mortar dropping removed.

Curing:

Green work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for a period of seven days. The top of masonry work shall be kept well wetted at the close of the day.

Mode of measurement & Payment:

The measurement of this item shall be taken for the brick masonry fully completed in foundation up to plinth. The limiting dimensions not exceeding those shown on the plans or as directed shall be final. Battered tapered and curved position shall be measured net.

The rate shall be for a unit of one cubic meter.

The testing of material is to be carried out at the cost of the contractor.

ITEM NO. 18- PLASTER WORK

Providing cement plaster 12 mm thick using cement mortar in proportion 1:3 with Neeru finishing, curing etc comp.

Materials: Water shall confirm to M-1 and Cement Mortar shall confirm to M-11

Workmanship:

12 mm thick cement plaster in single coat in CM 1:3 (1-cement : 3-sand) with a floating coat of neat cement slurry.

Scaffolding:

Wooden bullies, bamboos, planks, treatles and other scaffolding shall be sound. These shall be proper examined before erection and use. Stage scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

This kind of Plaster is normally for interior side or as specified location by Consultant to be applied as above. NORMAL CEMENT PLASTER and the surface shall be rubbed smooth after coating it with a thick coat of pure Portland cement slurry while the base coat is still fresh. If Neeru plus cement finish is specified floating with neat cement will not be required.

Mode of Measurement & Payment:

The rate shall include the cost of all materials labour and scaffolding etc. involved in the operations described under workmanship.

All plaster shall be measured in square meter unless otherwise specified length, breadth or height shall be measured correct to a centimeter.

Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 10 mm at any point on this surface.

This item includes plastering up to floor two level.

The measurement of wall plastering shall be taken between the walls or partition (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height, depth of cover of cornices, if any, shall be deducted.

Soffits of stairs shall be measured as plastering on ceilings. Elowigns soffits shall be measured separately.

For jambs, soffits, sides, etc. for openings not exceeding 0.5 sq.mt. each in area for ends of joints, beams, posts girders, steps etc. not exceeding 0.5 sq.mt. each in area and for openings exceeding 0.5 sq.mt. and not exceeding 3.00 sq.mt. in each area deductions and additions shall be made in the following manner:

- a) No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 sq.mt. each and no addition shall be made for reverse, jambs, soffits, side etc. of these openings, for finish to plaster around ends of joints, beams, posts etc.
- b) Deductions for openings exceeding 0.5 sq.mt. but not exceeding 3.00 sq.mt. each shall be made as following and no addition shall be made for reverse, joints, soffits, sides, etc. of these openings.
 - i) When both faces of all walls are plastered with same plaster. Deductions shall be made for one face only.
 - ii)
 - For openings having door squares equal to or projecting beyond the thickness of wall. Full deduction for opening shall be made from each plastered face of the wall.
 - In case of openings of area above 3 sq.mt. each deduction shall be made for opening but Jambs, soffits and slits shall be measured.
 - The rate shall be for a unit of square meter.

ITEM NO. 19 - IRON WORK

Iron work for valve chamber cover as directed by engineer in-charge etc comp.

All structural steel shall conform to IS 266 - Latest edition. The steel shall be free from the defects mentioned in IS 226 (Latest edition) and shall have a smooth finish. The material shall be free from loose mill scale, rust, pits or other defects affecting the strength and durability. River bars shall conform to IS 1148 Latest edition.

When the steel is supplied by the contractor, test certificate of the manufacturer shall be obtained according to IS 226 Latest edition and other relevant Indian Standards.

The design should be made as per the instructions of engineer-in-charge. The rate includes supplying and welding (along with labours), transportation and fixing in position of the steel work.

The rate shall be for a unit of one Kilogram.

ITEM NO. 20 - REINFORCEMENT WORK

Supplying, Cutting, Bedding, Binding and Hooking and binding with wire for RCC work Tor steel TMT round bar including all cost etc comp.

The design shall be for seismic zone as per Indian standard. Water density shall be taken as 9.81kN/m³. Age factor for increase in strength shall not be considered for design.

Corrosion resistant steel TMT Fe – 415/500 (from approved vendor list) shall be used.

Minimum steel: Design requirements as set out in relevant codes in respect of steel shall be fully satisfied. However following minimum steel should be provided.

a. Vertical steel in columns	<p>The cross sectional area of longitudinal reinforcement, shall not be less than 0.8 percent nor more than 6 percent of the gross cross sectional area of the column.</p> <p>NOTE : The use of 6 percent reinforcement may involve practical difficulties in placing and compacting the concrete, hence lower percentage is recommended. Where bars from the columns below have to be lapped with those in the column under consideration, the percentage of steel shall usually not exceed 4 percent.</p> <p>In any column that has a larger cross-sectional area than that required to support the load, the minimum percentage of steel shall be based upon the area of concrete required to resist the direct stress and not upon the actual area.</p>
b. Horizontal links in columns	Not less than 8 mm dia at 200 mm center to center or 10 mm dia not more than 300 mm center to center.
c. Exposed R.C.C. surface	On both faces when thickness is 150 mm or more 2 kg/ sqm in one direction.

	<p>-2 kg / sqm in perpendicular direction.</p> <p>The above requirement is satisfied if 8 mm bars @ 200 mm center to center or 10 mm bars @ 300 mm center to center are provided.</p> <p>Even if design steel is less than above, the above minimum shall be provided.</p>
d. Water Retaining Members	<p>The minimum reinforcement in walls, floors, roofs in each of two directions at right angles shall have an area of 0.35% of the concrete section in that direction for sections upto 100 mm thick. For section of thickness greater than 100 mm and less than 450 mm the minimum reinforcement in each of the two directions shall be linearly reduced from 0.35 % for 100 mm thick sections to 0.2 % for 450 mm thick section. For section of thickness greater than 450 mm minimum reinforcement in each direction shall be kept at 0.2 %. In concrete sections of thickness 225 mm or more, two layers of reinforcing steel shall be placed one over each face of the section to make up the minimum reinforcement specified in this clause.</p>

Minimum cover to reinforcement shall be as per I. S. 456 – 2000 and I. S. 3370 (Latest version).

Clear cover shall be provided as below:

- a) Footing/ raft : 60 mm at bottom, sides and at top
- b) Columns : 40 mm
- c) Beams, slabs, vertical wall, gallery landings. : 40 mm

Maximum spacing of Reinforcement: Maximum spacing of main reinforcement in slab or walls shall not be more than 150 mm center to center. The spacing of secondary bars, such as distribution steel or vertical bars in columns shall not be more than 300 mm.

Design shall be based on accepted bases and well known methods of design as well as the provision of I. S. (Latest edition). However methods based on experimental investigation on models as mentioned in para 18.2 3 in I. S. 456 – 2000 shall not be allowed. Similarly the methods / practice of design having no documented evidence shall not be entertained. Only well defined & well known methods of design shall be followed.

ITEM NO. 21 - EXPANSION BELLOW

Expansion Bellows (Flanged) :

Providing testing of corrugate design stainless steel expansion bellows with flanges, 15mm axial movement, 300mm overall length with tie roads, nuts etc with fitting and Fixing etc comp. PN 1.6

Expansion bellow are used before butterfly valves, pumps and other equipment to provide flexibility to the equipment installations by joining flanged spigot and flanged coupling adapter into one assembly.

Expansion bellow are fully end load resistant and have a pressure rating equal to that of the flange and design and specification must be as per applicable Indian standard.

Manufacturer's Guarantee

The manufacturers shall guarantee that if any defects chargeable to faulty workmanship, design or materials are found in the dismantle joint within a period of one year of dispatch be shall replace any part that prove defective, free of charge at the place of dispatch.

Information Required

The following information shall be cast on each joint:

- (a) Manufacturer's name or trademark and size.

Packing and Handling

- The materials shall always be packed separately dispatched from manufacturer's works with adequate protective measures to prevent damages deterioration while in transport or stored at any place. The packing shall always be so neat and tidy that may withstand any robust and rough handling.
- When the materials are transported at railway risk, special packing as per IRCA rules are absolutely necessary for which the extra cost, if any, shall be borne in total by supplier only.

- The supplier shall use proper handling instruments/equipment's and shall follow to a suitable method of handling pipes as may be approved by Engineer, while unloading and stacking material in the stores.

Materials and Workmanship

- General requirements of materials and workmanship shall mean any material or article either raw or finished one is required to be used in the manufacturing process of tanks.
- All the material shall be new and of high quality.
- In case, if material is not specified by relevant ISS for manufacturing part or the whole as item, the supplier shall prepare specifications in concurrence with manufacturer and shall seek an approval of Engineer prior to its use in the manufacture.

Test Certificate

- The supplier shall always provide manufacturer's test certificate in accordance with every batch/lot of goods so manufactured and supplied.
- The supplier shall also produce in addition to manufacturer's test certificate as mentioned under "inspection & testing above", the inspection certificate issued by the employer or his authorized person / agency appointed.

Inspection

This clause is applicable in general to all materials such as all types of valves, pre-cast chambers, other specials and materials, dismantle joints etc. which are to be supplied by the contractor. Inspection should be in presence of Rajkot Municipal Corporation officials and PMC officials as and when required.

Mode of measurement of payment:

The rate shall be paid per NUMBER basis of actual work done.

ITEM NO.22: DISMENTALING JOINT

The M.S. Dismantling joint is to be prepared as per drawing and as directed by engineerr incharge the joint shall be fabricated to desigen and petern shown in drawing using approved quality of M.S. plate, angle, nutbolt etc. and shall be welded as shown or as directed the joint included all the cost of leabour, machinery, welding machine, fixing, painting with anty corrosive paint etc. the joint shall be fixed as directed.

Mode Of Measurement And Payment:

The rate shall be per kilogram work.

ITEM NO.23: ZERO VALOCITY VALVE

Water Hammer Control Device: Providing, Supplying, and delivery of water hammer control devices for use on various pumping main of following class and diameter including all taxes, insurance, transportation, freight charges, loading unloading, conveyance to departmental stores, stacking etc. complete. Zero velocity valve with MS body Class 15 500 mm dia

500MM DIA

ACCEPTED CONTROL SYSTEM

Following types of control systems are only accepted for control of water hammer pressures in the pumping mains.

Zero Velocity Valves and Air Cushion Valves.

WATER HAMMER CONTROL

SPECIFICATION FOR WATER HAMMER CONTROL DEVICE WITH ZERO VELOCITY VALVE AND AIR CUSHION VALVE

400 mm dia Test pressure - 10.0 kg/Cm² or 15kg/Cm² as required

The valve has an outer fabricated casing ('Main Body') in which a 'Central Rod' is held by struts. A 'Stationary Central Dome' creates an annular streamlined passage for smooth flow of water. Closing Disc is mounted on 'Central Rod'. Disc is held in closed position by a number of 'Stainless Steel Springs' (as per AISI 304). Two 'Anti Rotation Guides' are provided on the edge of 'Central Disc' with minimum resistance to flow. 'Anti Rotation Guide' is clad with Stainless Steel Strip (as per AISI304) and 'Guide Fork' with brass liners. A 'Bypass' with a 'Valve' connects upstream and downstream sides of valve. A 'Man Hole' is provided on 'Outlet' cone of main body, for maintenance and replacement of spring (if required) without removing the valve from line. The 'Outer Shell', 'Dome' & 'Disc' are fabricated out of M.S. plates as per IS 2062. A stainless steel sleeve (as per AISI 304) is fitted on 'Central Shaft' and moves in brass bush in 'Disc' for free movement. The Valve will be painted in Zinc Rich Epoxy Paint from inside and outside.

The rate shall be paid per No. basis.

Payment

Measurement shall be paid on number basis as per schedule of payment.

The rate shall be paid per NUMBER basis of actual work done.

ADDITIONAL CONDITIONS:

1. The contractor shall have to provide his own level instrument for this work (if required).
2. Lowering, laying and jointing works of the DI pipelines shall have to be carried out by using Sight Rails and Boning Staves (if required).
3. Work is required to be carried out in residential area where all the services like water supply, sullage water pipeline, gas pipeline, telephone / electric cable are existing. Under the circumstances, prior to starting the work agency shall have to excavate the trenches **manually** for up to minimum **1.20 mt. depth**. During the course of execution, all the services shall have to be maintained by the agency and any damage to any services or property, the agency shall have to get it repair at their cost.
4. For excavation of trench, use of JCB machine will not be permitted directly on the top surface of the road. After excavation up to minimum 1.00 mt. depth from road surface or existing ground level, same shall have to be carried out manually or by using Breaker and after locating underground services like; water supply pipeline, gas pipeline, water connection lines, pipe gutters, telephone cables, electric cables etc., and thereafter upon taking the prior approval of the Engineer-In-Charge, the excavation can be carried out by using JCB machine.
5. Rajkot Municipal Corporation shall recommend to the competent authority to give Controlled Blasting License to the contractor for carrying out excavation in hard rock. In case of blasting license not permissible from the competent authority in some places then excavation is to be done by using wedges and hammers, chiseling, breakers, pneumatic tools, etc. Also in case where blasting license is permitted but even then if there is no possibility of carrying out the blasting for whatsoever reason, the excavation is to be done by using Wedges and hammers, chiseling, breakers, pneumatic tools etc. No extra payment shall be made for excavation to be carried out in any of the above mentioned both the situations.
6. Excavation in soft rock and hard rock shall have to be carried out only by Chiseling, Breaker (pneumatic tools) etc., as far as possible. If excavation is not possible in terms of above and if excavation is required to be carried out with the help of blasting then the same shall have to be carried out only after taking prior approval and necessary license for blasting from the competent authority.
7. In case of excavation not possible manually or by chiseling in certain place(s) as well as if blasting is also not possible due to various reasons i.e. to avoid damage to

- nearby water pipeline, pipe gutter, telephone cables / Duct, Raw houses / week buildings / narrow street etc., then the excavation by blasting will not be permitted. Under these circumstances, excavation shall have to be carried out only by Breaker (pneumatic tools) as per the instructions of the Engineer-In-Charge. No extra payment will be made for such type of excavation done by using Breaker. The rate for excavation shall be paid as per the rate of related item mentioned in Schedule-B.
8. The safety of the trenches is the prime important factor. Along the trenches on both the side, a hump of excavated stuff of minimum height 3 to 5 ft shall have to be provided till the work is got completed. However, where there is no defined road, in such area, the fencing/ lighting etc., requires to be provided as per safety clause. Sign Board shall have to be provided at required locations, so that there will not be any fatal accident.
 9. The quantity of various items mentioned in the schedule-B is liable to increase or decrease up to any extent. Under the circumstances, the contractor shall have to carry out the work accordingly without any rate escalation. Rajkot Municipal Corporation will not entertain any dispute in this regard.
 10. In excavation, the decision regarding classification of strata shall rest with the Engineer-In-Charge and his decision in this regards shall be final and binding to the Contractor.
 11. The rates are inclusive of dewatering, if required.
 12. In case of any ambiguity found in specifications / drawings etc, the decision of engineer-in-charge shall be final and binding to the contractor.
 13. The contractor shall have to arrange for a vehicle at his own cost for staff of Rajkot Municipal Corporation to visit the factory for testing of M.S., D.I. pipe and valve. The contractor himself shall also have to join the staff of RMC at the time of visit to factory for testing of M.S., D.I. pipe and valve.
 14. RMC will accept saving material of only M.S./D.I. pipe 5% of tender quantity or 50.00meter whichever is less and full length of pipe without any defect.

ARRANGEMENT OF TRAFFIC DIVERSION DURING CONSTRUCTION

a) General: The contractor shall at all times carry out work on the road in a manner creating least interference to the flow of traffic while consistent with the satisfactory execution of the same. For all work involving improvements to the existing road the contractor shall, in accordance with the directives of the Engineer-in-charge, provided and maintain, during the execution of the work, a passage for traffic along a part of the existing way under improvement, or along a temporary diversion constructed close to the road.

b) Passage of traffic along a Temporary Diversion: If in the opinion of the Engineer-in-charge it is not possible to pass the traffic on part width of the carriage way for any reason, a temporary diversion close to the road shall be constructed as directed. It shall be paved with locally available materials such as hard murrum, gravel, brick or stone metal to the specified thickness and provided with bituminous surfacing, where directed. In all case, the alignment, gradients and surface type of the diversion, including its junctions, shall be approved by the Engineer-in-charge before the highway is detoured and closed to traffic. At cross drainage points, the contractor shall provide temporary crossings for the diversion according to the designs approved by the Engineer- in-charge.

c) Traffic Safety and control: The contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, fights and flagmen as may be required by the Engineer- in-charge for the information and protection of traffic approaching or passing through the section of the road under improvement. Before taking up any construction, an agreed phased programme for the diversion of traffic on the highway shall be drawn up in consultation with the Engineer-in-charge.

The barricades erected on either side of the carriage/portion of the carriage way closed to traffic, shall be of strong design to resist violation, and painted with alternate black and white stripes. Red lanterns or warning lights of similar type shall be mounted on the barricades at night and kept throughout from sunset to sunrise.

At the point where traffic is to deviate from its normal path whether on temporary diversion or part width of the carriage way the channel for traffic shall be clearly marked with the aid of pavement markings painted drums or a similar device to the directions of the Engineer-in-charge. At night the passage shall be delineated with lanterns or other suitable light source.

One way traffic operation shall be established wherever the traffic is to be passed over part of the carriage way inadequate for two-lane traffic. This shall be done with the help of flagmen kept positioned on opposite sides during all hours for regulation of traffic. The flagmen shall be equipped with red and green flags and lanterns/lights.

On both sides suitable regulatory/warning signs shall be installed for the guidance of road users, On each approach at least two signs shall be up put one close to the point where transition of carriage way begins and the other 120 meters away. The signs shall be of approved design and of refractory type if so directed.

d) Maintenance of Diversion and traffic control Devices: Signs, lights, barrier and other traffic control devices as well as the riding surface of diversions shaft be maintained, in satisfactory conditions till such time they are required as directed by the Engineer-in-charge. The temporary travel way shall be kept free of dust by frequent application of water if necessary.

e) Measurements for payment traffic Arrangement: All arrangements for traffic during construction including maintenance these off but excluding initial dressing and/or extra

treatment of the shoulders and construction of temporary diversions shall be considered as incidental to the works and Contractor responsibility. There will be no extra charge to contractor for this.

The work in general shall be carried out as per instructions & approval of engineer in charge.

Add. Asst. Engineer
Rajkot Muni. Corporation

Dy.Executive Engineer
Rajkot Muni. Corporation

Executive Engineer
Rajkot Muni. Corporation

Signature of Contractor

APPROVED VENDOR LIST

SR. NO.	PARTICULARS	DESCRIPTION
1.0	DI PIPES & SPECIALS/ FITTINGS	ELECTROSTEEL,JINDAL, ELECTROTHERM,
2.0	UPVC PIPES ASTM STANDARDS	SUPREME, PHINOLEX, JAIN, ASTRAL, WATERFLO,
3.0	UPVC - FITTINGS	SUPREME, PHINOLEX, JAIN, ASTRAL, WATERFLO,
3.0	TAPPING FERRULES	AS PER IS STANDARD BUT LONG BODY
4.0	RIGID PVC SADDLE	ISI MARKED & REPUTE COMPANY,
5.0	SLUICE VALVE/BUTTERFLY VALVE ISI MARKED ONLY.	KIRLOSKAR / IVC / IVI/ FOURESS.
6.0	AIR VALVE	KIRLOSKAR / IVC / IVI/ FOURESS.
7.0	MS PIPE SPECIALS	SAIL, WELSPUN, JINDAL, SAW, ESSAR STEEL.
8.0	PRESSURE GUAGE	H GURU / BELLS & CONTROL / GENERAL INSTRUMENT
9.0	FLOW METER	ACCUSONIC (U.S.A) / DANFOS / RITTMAYER (I,S,K, ENGG. MUMBAI) / E+H / KROHNE MARSHALL / ULTRAFLUX (FRANCE)
10.0	CHECK VALVE	KIRLOSKAR / IVC / IVI / UPADHAYA
11.0	CEMENT	AMBUJA, ULTRA-TECH, ACC, SANGHI, SIDDHI, LOTUS, HATHI
12.0	WELDING ROD	ADOR(ADAWANI), ESAB

Signature of contractor